Implementing Cost Capability Analysis (CCA)

Mr. Harry Conley
HQ AFMC/A5C
3 Jul 14

Purpose

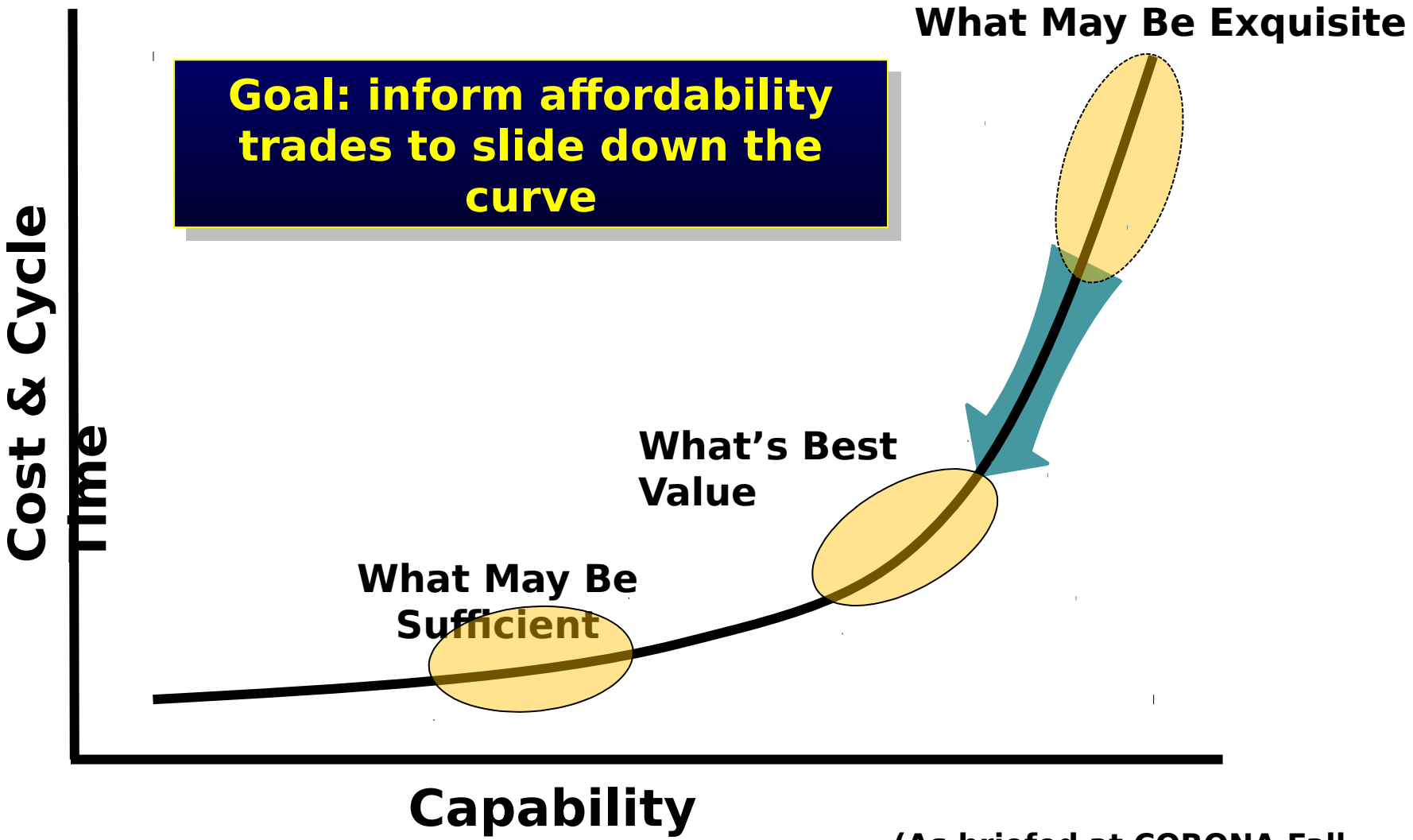
- **Identify actions to implement Cost Capability Analysis in the Air Force**
  - **Response to CORONA Fall 2011 Task 9 - Contractual and Operational Requirements Sufficiency**
  - **Resources required (answer to SECAF's question)**
  - **Implementation actions**

Achieves BBP 2.0 objectives by building a stronger partnership between acquisition and requirements communities to control costs

Overview

- **Background/Tasking**
- **Lessons Learned**
- **Recommendations**
- **Implementation Actions**

Cost Capability Analysis: The Concept


Goal: inform affordability trades to slide down the curve
What May Be Exquisite
What's Best Value
What May Be Sufficient
Cost & Cycle Time
Capability

(As briefed at CORONA Fall 2011)

Background

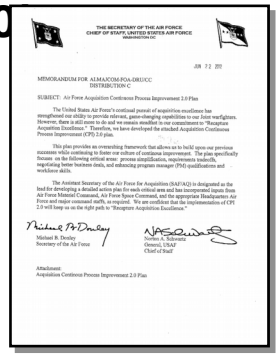
2011 CORONA Fall

- **Task-9 directed AF/A3/5 and SAF/AQ to conduct Contractual Requirements Sufficiency**
  - **Problem: Too many programs are too costly resulting in either lower quantity fielded or terminating programs**
  - **Goal: Improve understanding of effects of requirements on cost and cycle time to inform affordability decisions**
  - **Solution: Determine explicit steps**

RIE Finding, #1 Root Cause: "Decision makers are not demanding cost capability analysis to inform decisions in acquisition or requirement forums"

2012 - CPI 2.0 Plan

- **Acquisition Continuous Process Improvement (CPI 2.0) identified seven root causes and solutions strengthen linkage between acquisition and requirements**


THE SECRETARY OF THE AIR FORCE
CHIEF OF STAFF, UNITED STATES AIR FORCE
WASHINGTON DC

MEMORANDUM FOR ALMAJCOM-FOA-DRU/CC
DISTRIBUTION C

SUBJECT: Air Force Acquisition Continuous Process Improvement 2.0 Plan

The United States Air Force's continual pursuit of acquisition excellence has strengthened our ability to provide relevant, game-changing capabilities to our Joint warfighters. However, there is still room to do and we remain steadfast in our commitment to "Recapture Acquisition Excellence." Therefore, we have developed the attached Acquisition Continuous Process Improvement (CPI) 2.0 plan.

This plan provides an overarching framework that allows us to build upon our previous successes while continuing to foster our culture of continuous improvement. The plan specifically focuses on the following critical areas: process simplification, requirements tradeoffs, negotiating better business deals, and enhancing program manager (PM) qualifications and workforce skills.

The Assistant Secretary of the Air Force for Acquisition (SAF/AQ) is designated as the lead for developing a detailed action plan for each critical area and has incorporated inputs from Air Force Materiel Command, Air Force Space Command, and the appropriate Headquarters Air Force and major command staffs, as required. We are confident that the implementation of CPI 2.0 will keep us on the right path to "Recapture Acquisition Excellence."

Michael B. Donley
Secretary of the Air Force

Norton A. Schwartz
General, USAF
Chief of Staff

Attachment:
Acquisition Continuous Process Improvement 2.0 Plan

- **22 Jun 12, CSAF and SECAF signed CPI 2.0 Plan**
  - **Implement requirements trade-off initiative**

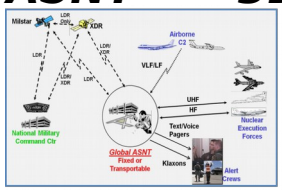
Mandates cost/schedule capability/design trade-off curves throughout the life of the program!

Codified In AFI 10-601 (6 Nov 2013) ***"Lead Command/CFLI in conjunction with the Implementing Command, produces and presents cost capability analysis, provides results at all requirements and acquisition forums, and includes in Analysis of Alternative (AoA) Final Reports, Capability Development Document (CDD), and Capability Production Document (CPD)"***

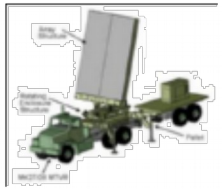
Background Aug 12 SECAF Update

- ***"Ensure the AF has the right engineering and costing expertise to develop the required cost vs. performance curves and affordability trades in support of the AFRRG and other requirement and acquisition bodies" (OPR: AFMC/A2/5)***
  - **AF may not have the expertise, people, or processes in place to perform the required cost capability analysis at this time**
  - **Pilot efforts will determine what it takes**
    - **-- Skills & numbers of engineering & cost professionals**
    - **-- Procedures and tools**
  - **Way Ahead: Apply lessons learned to future programs**
- ***What programs will be used as trial programs for the improved requirements concept that was briefed? (OPR: AF/A5R)***

G-ASNT 3DELRR T-X GBSD PAR F-15 EPAW



Global Aircrew Strategic Network Terminal



3 Dimensional Expeditionar

Advanced Pilot Training Systems

Ground Based Strategic Deterrent

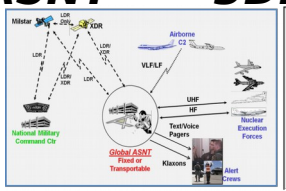
Presidential Aircraft Recap

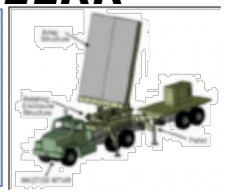
F-15 Eagle Passive/Active Warning & vability System

SECAF asked what resources are required for CCA

Cost Capability Lessons Learned from the Pilot Programs

-ASNT | 3DELRR | T-X | GBSD | PAR | F-15 EPAWSS





Timing and Decisions

- Must start early @ CBA, ICD, DP, and AoA; maintain throughout life cycle
- Need to better integrate requirements and acquisition decision making

Processes

- No formal/standard CCA process existed—Pilot teams made it up on the fly
  - Standard approach for determining military value was lacking
  - Depicting results of analysis was more difficult than expected

Industry's Role

- Industry requirements trade space analysis provided valuable insights to decisions

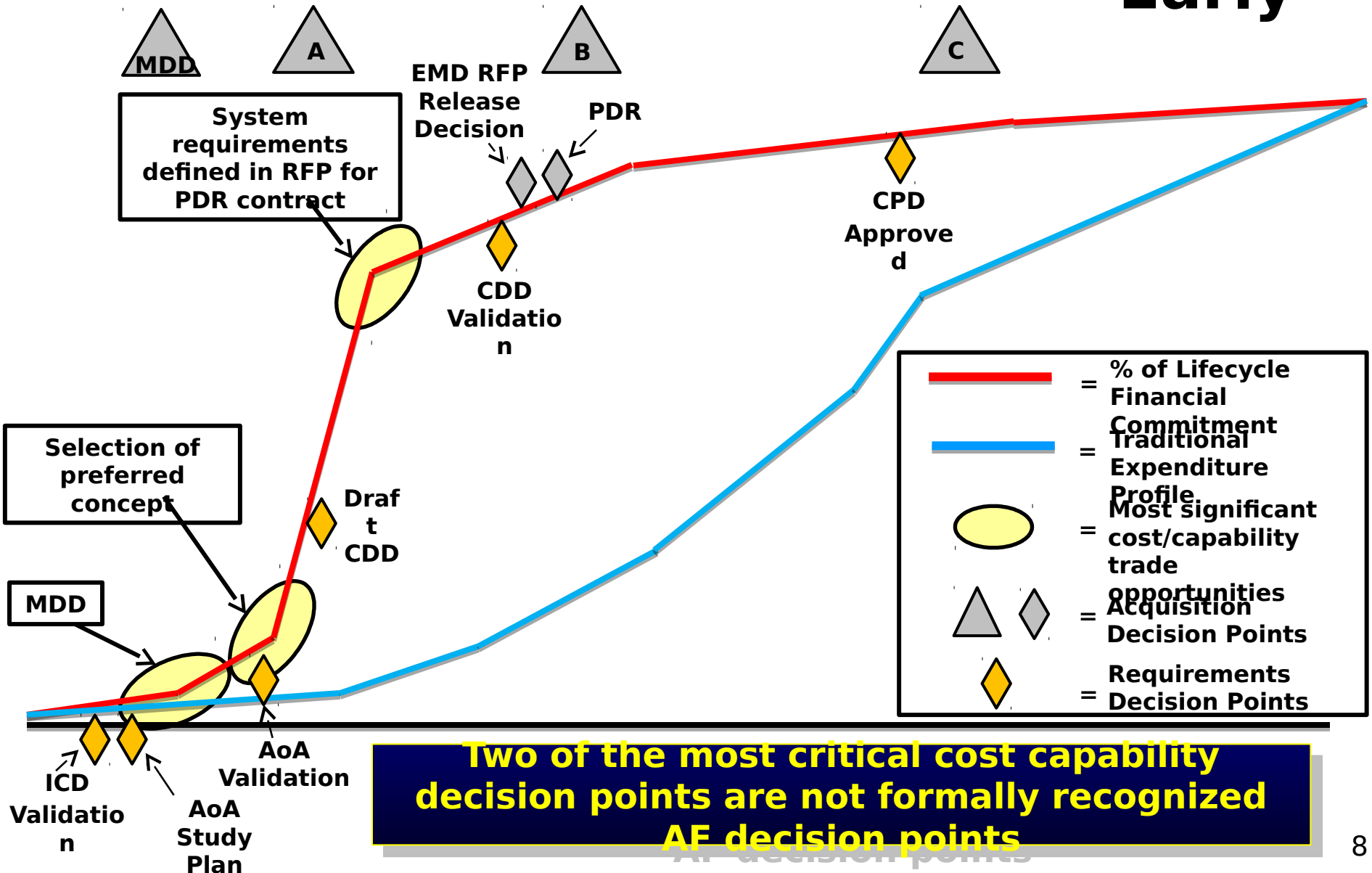
People/Skillsets, Tools, Training

- Multi-disciplined team needed to cor
- Specialized skillsets were needed
- Decision analysis tools would have helped

Affordability Savings

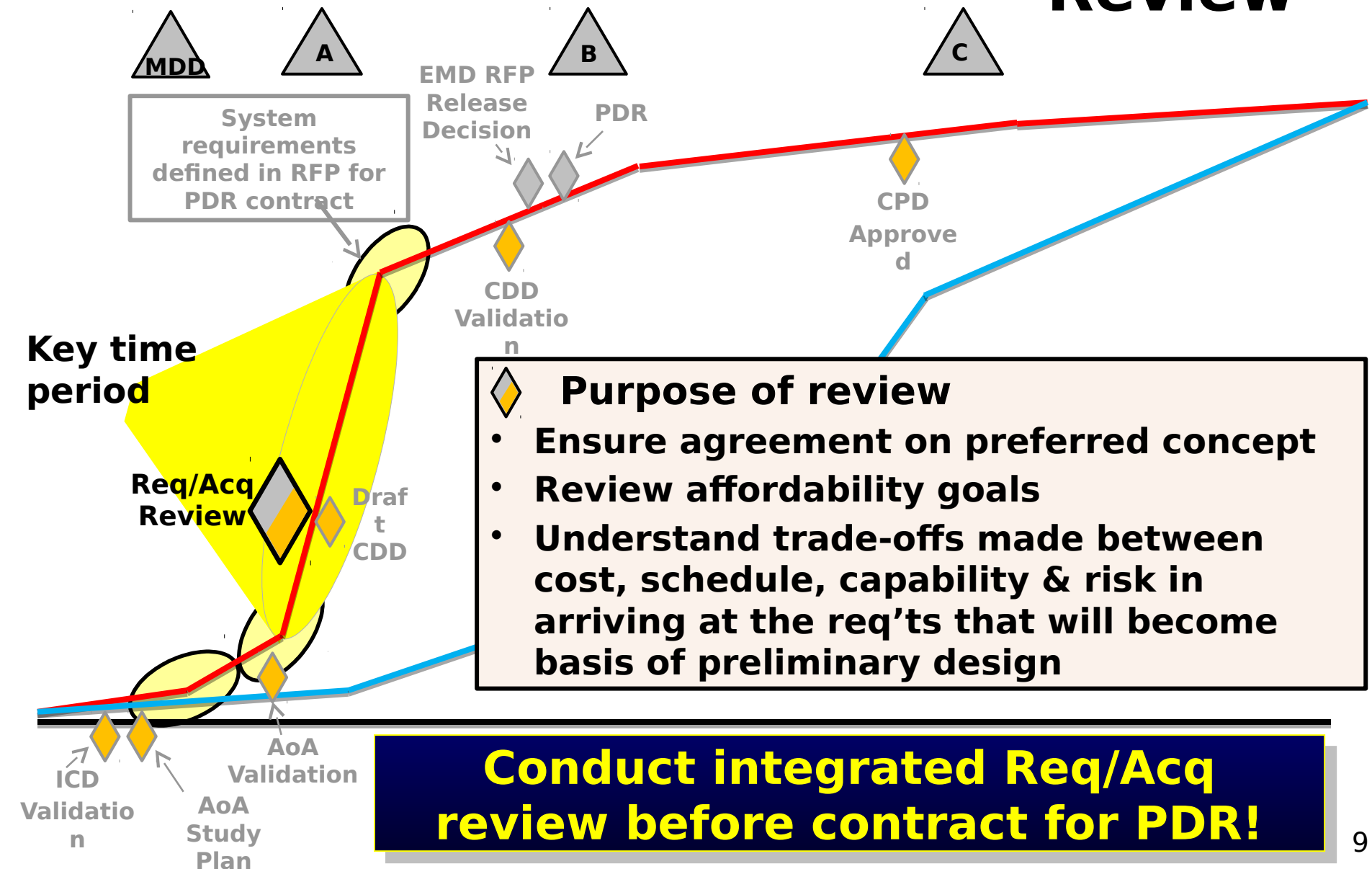
	G-ASNT (TY - RDT&E)	3DELRR FY14-18 (TY)	T-X	PAR (TY)	F-15 EPAWSS (BY13)
Cost Savings or Avoidance	$30M	$138M	TBD	$1.8B	$1.7B

The Most Significant Cost Capability Trades Happen Early



Two of the most critical cost capability decision points are not formally recognized AF decision points

Need Early Integrated Requirements & Acquisition Review

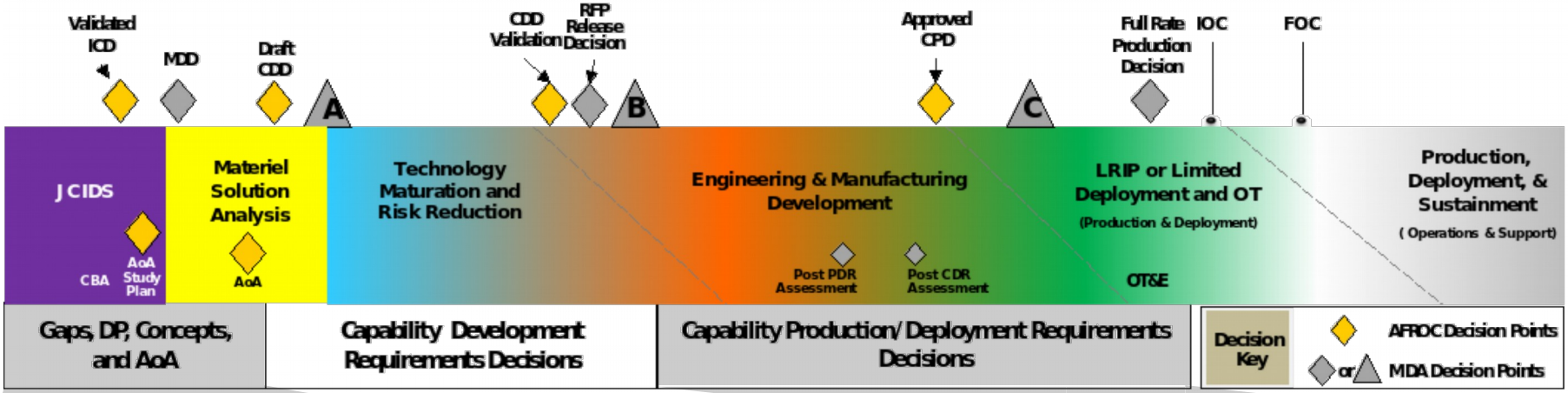


Purpose of review

- Ensure agreement on preferred concept
- Review affordability goals
- Understand trade-offs made between cost, schedule, capability & risk in arriving at the req’ts that will become basis of preliminary design

Conduct integrated Req/Acq review before contract for PDR!

CCA Decision Framework



- Are the capability gaps prioritized? What is the military value as operational capability is increased (or decreased) for each gap?
- **What tradeoffs between cost, schedule and capability will be evaluated during the Analysis of Alternatives?**
- **What is the preferred concept? Is it cost effective? Does it fit within the affordability goals?**
- **For the preferred options,**

- **What operational requirements in the CPD are the primary cost drivers? Are they subject to change as a result of new validated threats or OT&E results?**
- **How were tradeoffs between cost, schedule and capability considered in determining these requirements?**
- **How have affordability goals and constraints been included in the program and how will**

Proposed Standardized CCA Process

Step 1 – Identify the Problem

Step 2 – Create Value Hierarchy

Step 3 – Develop the Measures

Step 4 – Identify Alternatives

Step 5 – Estimate Costs of Alternatives

Step 6 – Develop Value "Curves"

Step 7 – Prioritize Measures ("weighting" the things we Value)

Step 8 – Compute the Capability of Each Alternative

Step 9 – Display Cost Capability

Step 10 – Analyze Sensitivity

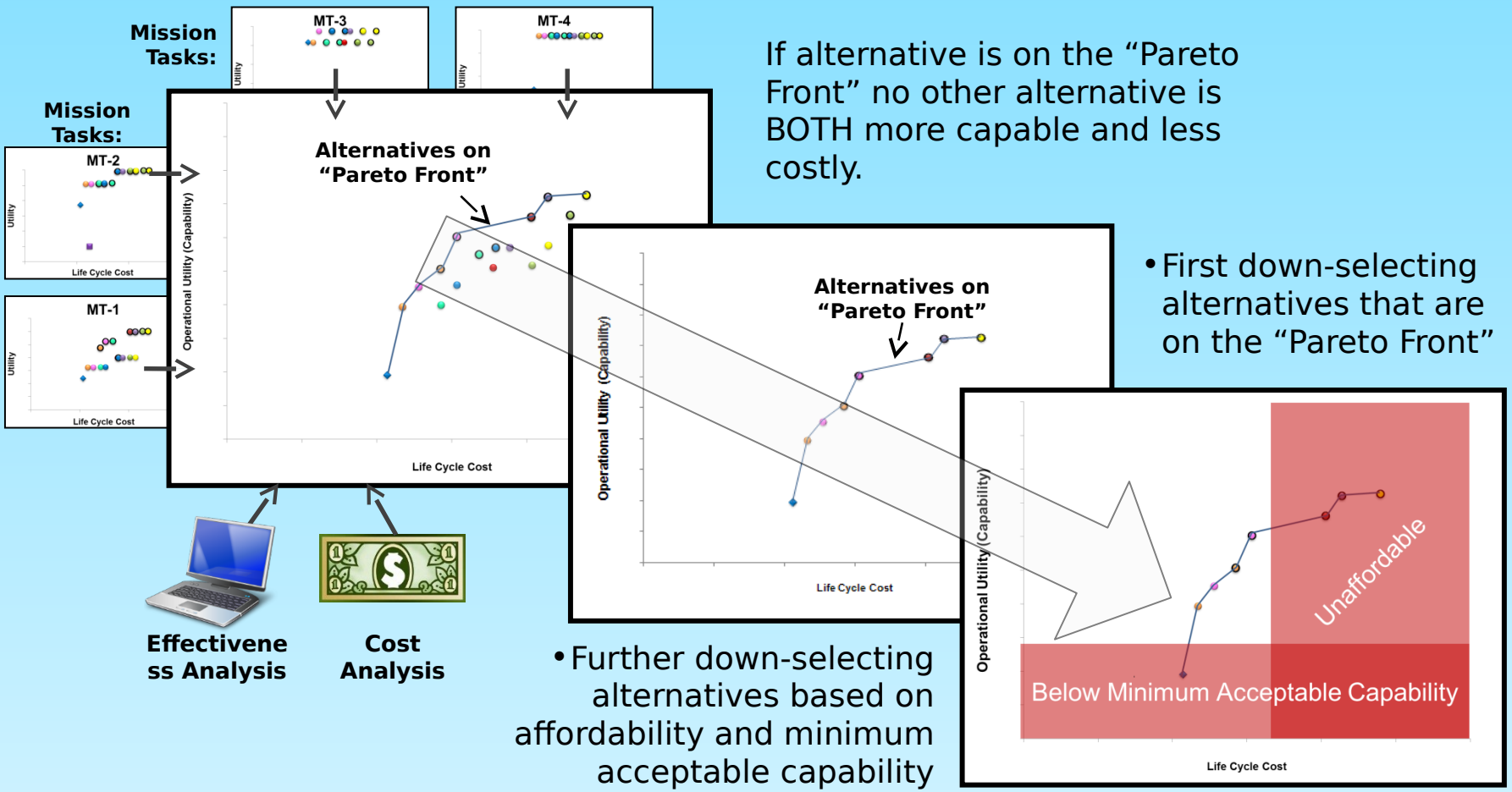
Step 11 – Recommendations and Conclusions

All steps are necessary

Blue highlights indicate steps to emphasize for CCA

Note: Standard process can be tailored for specific efforts

Depiction of Results at AoA



If alternative is on the "Pareto Front" no other alternative is BOTH more capable and less costly.

- First down-selecting alternatives that are on the "Pareto Front"
- Further down-selecting alternatives based on affordability and minimum acceptable capability

Leveraging Industry Insights

- **One Pilot program conducted trade space analysis using contractor-developed design configurations to adjust technical requirements and to reduce costs**
  - **Technology Development contract required cost and design data**
    - **-- Top 10 cost drivers (5 Gov't & 5 contractor) for each of 6 design configurations ("Show us the cost drivers!")**
    - **-- Design configurations demo'd full range of capability from lowest to highest costs**
    - **-- Systems costs: development, production, operations & support, life cycle cost, APUC, and total ownership**
- **Lessons learned**
  - **Industry perspective widened the trade space**
    - **-- Primes understood solution space more completely**
  - **Engaged industry early and often**
    - **-- Required Government time and planning – generic SOW not sufficient**
  - **Government validation required – inherent Government role**
    - **-- Unsubstantiated cost methodologies**
    - **-- Unclear risk and uncertainty in cost estimates**
    - **-- Aggressive proposed savings and schedules**

Add to Bending the Cost Curve (BTCC) initiative

CCA Team Composition

- **Requirements Sponsor, Operator, Program Manager, Systems Engineer, Modeling & Simulation Engineer/Analyst, Subject Matter Experts, "Cost Engineer" (Pre -A), Cost Estimator (Post -A)**
  - **Team already in place to conduct AoA**

- **Missing team member**
  - ***Operations Research (OR) Analyst***

Key Member	***Missing*** Critical Skills/Competencies
Operations Research Analyst	• **"Hands-on" facilitation skills to elicit sponsor/stakeholder input for value hierarchy** • **Critical thinker skilled in techniques used to delineate cost and overall utility of alternatives (e.g., decision analysis)** • **Ability to integrate effectiveness and cost**

Resources Required to Institutionalize CCA

People

- Need core team of experts at each implementing command
  - 4 Ops Research analysts (GS-1515/61S3A) to support non-space programs
  - 3 (est) Ops Research analysts at AFSPC/SMC

Training

- AFIT recommends three courses
  - Executive Overview
  - Intro to CCA
  - Practitioner

Tools

- Leverage existing decision analysis tools
- Integrate tools into core team

Process Manual

- Develop Air Force CCA Manual (MITRE)
  - Based on CCA Guidebook

Costs	
Recurring	Non-Recurring
$451K	
$370K	
	$250K
	$750K
$0.821M	$1M

Implementation Recommendations

Timing and Decisions

- Hold integrated requirements and acquisition review to examine cost capability trade space (AQ & A5R)

Processes/Policy

- Develop Air Force handbook (MITRE)
- Implement standard process (AFMC)
- Update policy (AQX & A5R)
  - Stipulate CCA in AoA Plans; codify integrated Req/Acq review
- Modify AoA Handbook to incorporate CCA (OAS)
- Revise AFROC and AFRB templates (AQX & A5R)
  - Include questions from cost capability decision framework

Industry's Role

- Leverage industry insights on cost drivers & trade space

Personnel/Skillsets, Tools, Training

- Establish CCA OR Team at AFLCMC and AFSPC/SMC
- Establish training program (AQX/AFIT)

Recommendations approved by ILCM-EF, 13 Jun 14

AFROC supported institutionalization and standardization, 19 Jun 14

Implementation Actions

- **Develop proposal for integrated req/acq review (A5R, AQX, AFMC, AFSPC)**
- **Establish CCA OR team (LCMC, AFSPC)**
- **Make policy changes (A5R, AQX)**
- **Modify AoA Handbook (OAS)**
- **Update AFROC/AFRB templates (A5R, AQX)**
- **Develop CCA training course (AQX provide funding)**
- **Develop CCA manual (AQX provide funding)**
- **Create process to gain industry insights on CCA (via BTCC Initiative)**

Summary

- **Identified resources required to implement CCA (answer to SECAF's question)**
  - **Small investment, large return**
- **Provided recommendations to implement CCA in the Air Force**
- **Implementation actions underway**

Achieves BBP 2.0 objectives by building a stronger partnership between acquisition and requirements communities to control costs

LEADING EDGE TECHNOLOGY
WORLD CLASS SUSTAINMENT
WAR-WINNING SYSTEMS

Policy

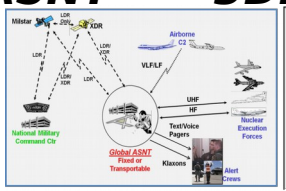
- **DoDI 5000.02**
  - The Program Manager will conduct a systems engineering trade-off analysis showing how cost and capability vary as a function of the major design parameters
  - During the acquisition life cycle, the Program Manager will conduct systems engineering trade-off analyses to assess system affordability and technical feasibility to support requirements, investment, and acquisition decisions. Systems engineering trade-off analyses will depict the relationships between system life-cycle cost and the system's performance requirements, design parameters, and delivery schedules.
- **AFI 63-101**
  - 5.4.3.2. At MS B, the PM shall provide cost tradeoff curves or trade space around major affordability drivers (including KPPs when they are major cost drivers) to show the program has established a cost-effective design point for these affordability drivers.
- **AFI 10-601**
  - SAF/AQ ensures tradeoff analyses of program life cycle cost / capability analysis are produced to capture tradespace and are provided before all requirements oversight reviews (e.g. AFRRG, AFROC) for affordability decisions.
  - Lead Commands, in conjunction with the Implementing Command, produces and presents cost capability analysis, provides results at all requirements and acquisition forums, and includes in AoA Final Reports, CDDs, and CPDs.
  - Implementing Commands, in conjunction with the Lead Command, produces and presents life cycle cost vs. capability analysis and provides results at all requirements and acquisition forums and include in AoA Final Reports, CDDs, and

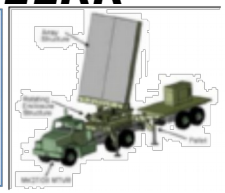
Process/Steps Taken to Respond to CORONA Tasker

- **Created corporate team**
  - **AFMC, AFSPC, HAF/A5R, SAF/AQX, AFLCMC, MITRE, AFIT, OAS**
- **Worked closely with "Pilot" programs to understand processes and lessons learned**
- **Applied lessons learned to develop:**
  - **CCA decision framework**
  - **Standard cost capability process in a detailed guidebook**
  - **Recommendations for implementation**
- **Deliverables from the team**
  - **Lessons Learned Report**
  - **Comprehensive Guide for a standard process**
  - **Implementation recommendations**
  - **Executive Outbrief**

Cost Capability Lessons Learned from the Pilot Programs

-ASNT 3DELRR T-X GBSD PAR F-15 EPAWSS





Timing and Decisions

- **Must start early @ CBA, ICD, DP, and AoA; maintain throughout life cycle**
- **Need to better integrate requirements and acquisition decision making**

Processes

- **No formal/standard CCA process existed—Pilot teams made it up on the fly**
  - **Standard approach for determining military value was lacking**
  - **Depicting results of analysis was more difficult than expected**

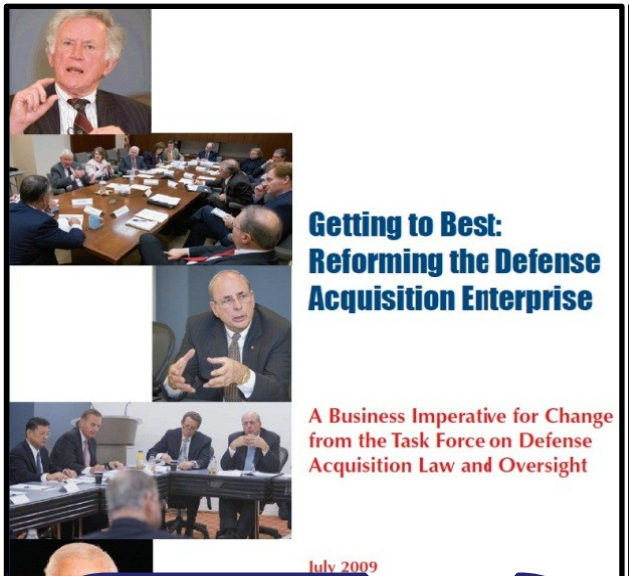
Industry's Role

- **Industry requirements trade space analysis provided valuable insights to decisions**

People/Skillsets, Tools, Training

- **Multi-disciplined team needed to conduct CCA**
- **Specialized skillsets were needed**
- **Decision analysis tools would have helped**

Prior Studies Found Issues with Early Cost and Req't Analysis



Getting to Best: Reforming the Defense Acquisition Enterprise

A Business Imperative for Change from the Task Force on Defense Acquisition Law and Oversight

July 2009

[Today's requirements process] needs **warfighters** who understand the nature of combat, **engineers** who understand the limits of technology, and **financial experts** who can accurately estimate

United States Government Accountability Office

GAO

Report to the Committee on Armed Services, U.S. Senate

March 2007

BEST PRACTICES

An Integrated Portfolio Management Approach to Weapon System Investments Could Improve DOD's Acquisition Outcomes

Proposed programs build momentum and move toward starting product development **with little if any early department-level assessment of the costs and feasibility.**

United States Government Accountability Office

GAO

Testimony

Before the Committee on Armed Services, U.S. Senate

For Release on Delivery
Expected at 9:30 a.m. ET
Wednesday, April 30, 2014

DEFENSE ACQUISITIONS

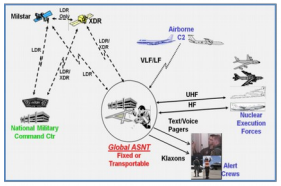
Addressing Incentives is Key to Further Reform Efforts

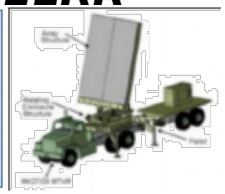
Statement of Michael J. Sullivan, Director
Acquisition and Sourcing Management

Programs often begin with validated requirements **uninformed** by solid systems engineering practices, often do not represent **true "needs,"** have optimistic **cost** and schedule **estimates**,

Cost Capability Lessons Learned from the Pilot Programs

-ASNT | 3DELRR | T-X | GBSD | PAR | F-15 EPAWSS





Timing and Decisions

- Must start early @ CBA, ICD, DP, and AoA; maintain throughout life cycle
- Need to better integrate requirements and acquisition decision making

Processes

- **No formal/standard CCA process existed—Pilot teams made it up on the fly**
  - **Standard approach for determining military value was lacking**
  - **Depicting results of analysis was more difficult than expected**

Industry's Role

- Industry requirements trade space analysis provided valuable insights to decisions

People/Skillsets, Tools, Training

- Multi-disciplined team needed to conduct CCA
- Specialized skillsets were needed
- Decision analysis tools would have helped

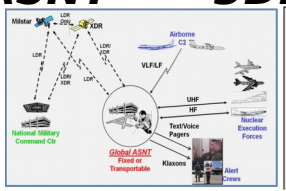
Need Standard Approach for CCA

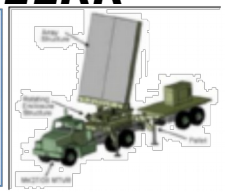
- **What is CCA?**
  - **Multi-objective decision analysis using cost and military utility to define trade space between cost and operational capabilities**
- **How to conduct CCA?**
  - **Obtain sponsor/stakeholder input upfront**
    - **-- Identify relative value in terms of operational capability (i.e., mission tasks, measures of effectiveness)**
  - **Integrate existing cost and effectiveness data to show trade space**

Need standardized process!

Cost Capability Lessons Learned from the Pilot Programs

-ASNT | 3DELRR | T-X | GBSD | PAR | F-15 EPAWSS





Timing and Decisions

- Must start early @ CBA, ICD, DP, and AoA; maintain throughout life cycle
- Need to better integrate requirements and acquisition decision making

Processes

- No formal/standard CCA process existed—Pilot teams made it up on the fly
  - Standard approach for determining military value was lacking
  - Depicting results of analysis was more difficult than expected

Industry's Role

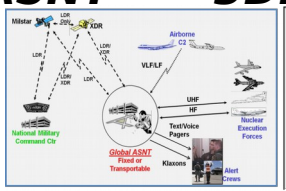
- **Industry requirements trade space analysis provided valuable insights to decisions**

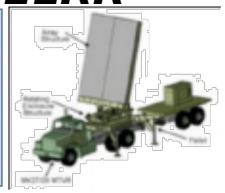
People/Skillsets, Tools, Training

- Multi-disciplined team needed to conduct CCA
- Specialized skillsets were needed
- Decision analysis tools would have helped

Cost Capability Lessons Learned from the Pilot Programs

-ASNT | 3DELRR | T-X | GBSD | PAR | F-15 EPAWSS





Timing and Decisions

- Must start early @ CBA, ICD, DP, and AoA; maintain throughout life cycle
- Need to better integrate requirements and acquisition decision making

Processes

- No formal/standard CCA process existed—Pilot teams made it up on the fly
  - Standard approach for determining military value was lacking
  - Depicting results of analysis was more difficult than expected

Industry's Role

- Industry requirements trade space analysis provided valuable insights to decisions

People/Skillsets, Tools, Training

- **Multi-disciplined team needed to conduct CCA**
- **Specialized skillsets were needed**
- **Decision analysis tools would have helped**

Proposed AFMC CCA Organizational Construct

Two roles needed

Process Owner (keeper of standard process)	Practitioner (performs the CCA)
Responsible for CCA guidebook, tools, policy and training needs	Hands-on facilitator assisting with defining the problem, scope and mission context
Maintains standard process	Conducts CCA
	Works with user to depict CCA results

CCA Operations Research (OR) Team

- **Group of analysts acting as a core unit**
- **Staffed with skilled Ops Research analysts equipped with appropriate tools**
- **Must be capable of supporting multiple simultaneous CCA projects**

Organization Options Considered: AFLCMC, AFMC/A5C/A9A/FM, and OAS

Pros	Cons
• Creates combined core organization • Aligns well with current AFLCMC mission (DP & Sys Eng) • Ensures close linkage with cost estimating and engineering expertise already in place • Closest possible linkage to program office • One office for CCA	• New mission and work; currently not resourced • Not a full Materiel Enterprise

Recommended Organizational COA: AFLCMC as Process Owner and Practitioner

Requires additional positions to implement

AFMC/A5C Provided CCA Guidance

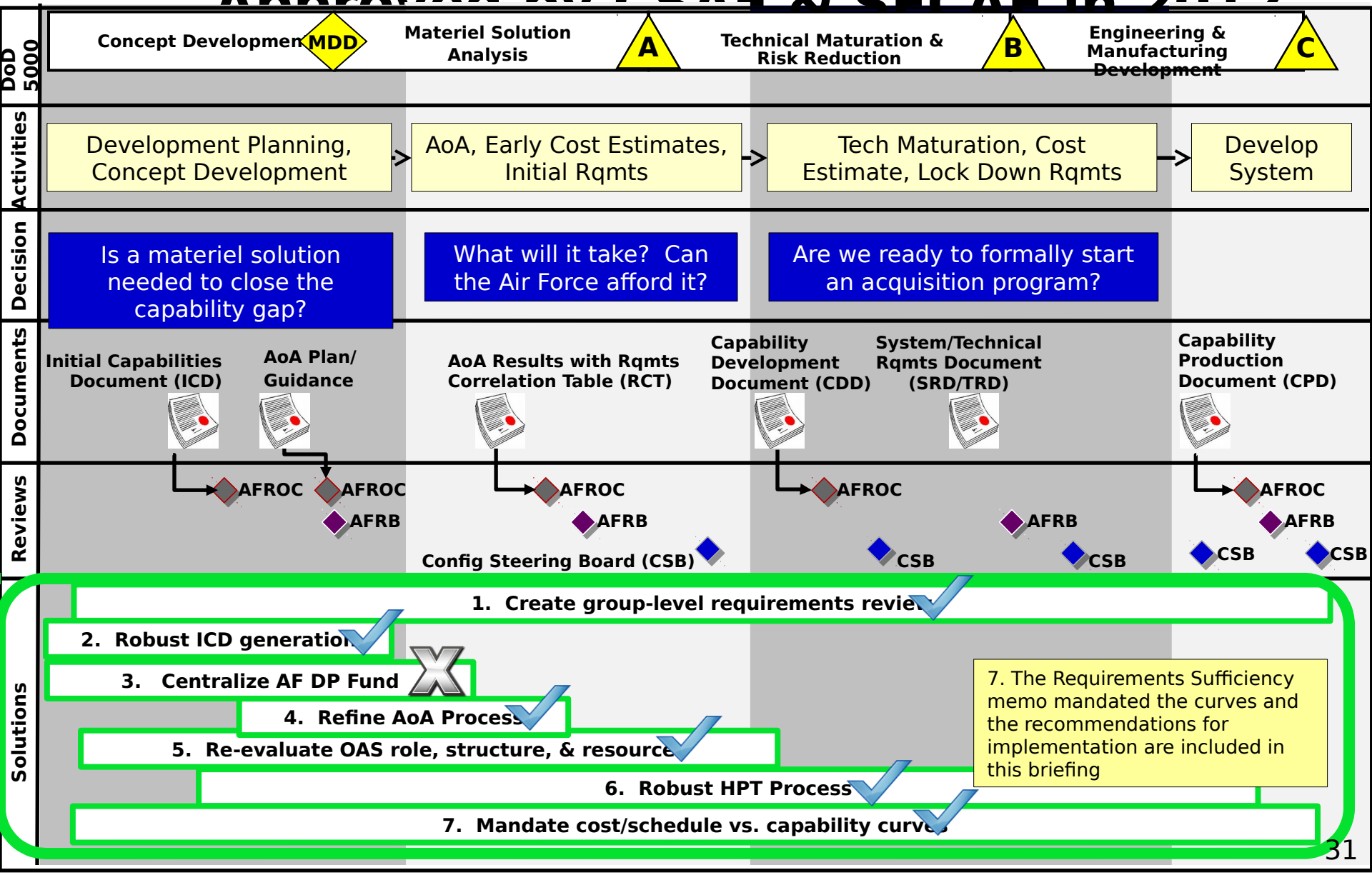
- B-2 CVR Inc 1
- B-2 Defensive Management System (DMS)
- AF Key Management Infrastructure-Last Mile (KMI-LM)
- Knowledge Operations (KO)
- B-52H 1760 Internal Weapons Bay Upgrade
- Hard Target Munition (HTM)
- Military GPS User Equipment (MGUE)
- 5th to 4th Generation Gateway System
- ARTSv2
- JSTARS
- Presidential Airlift Recapitalization (PAR)
- F-15 Eagle Passive/Active Warning & Survivability System (F-15 EPAWSS)
- Ground Based Strategic Deterrent (GBSD)
- Advanced Pilot Training Systems (T-X)
- C-130H VAAP
- UH-1N
- KC-46
- MQ-9

Not all-inclusive list

2012 RIE Root Causes (in priority order)

1. **Trade-off curves of cost capability are not being demanded or required by leaders in the acquisition or requirements communities**
   - **Hence, programs/MAJCOMs are not consistently doing the analysis to support stated capabilities or requirements (e.g., why is the range 105nm?)**
   - **Cost analysis and capability trade analysis not well documented**
2. **AF is not developing or explaining the total cost to develop and achieve a desired capability. We often overlook impacts and costs to other systems (e.g., AEHF satellite funded, but cost to develop and integrate terminals on platforms not fully considered)**
3. **AF lacks capability and capacity to do effective early cost analysis**
4. **Funding for Development Planning is not a priority for MAJCOMs**
5. **No cross-functional decision to generate ICD**
6. **Culture to deliver requirements at all costs**
7. **Process for translating operational requirements to system requirements may result in unintentional costs**

Requirements Sufficiency Solutions - Approved by CSAF & SECAF in 2012



Guidebook Overview

Chapter 1 - Introduction
Chapter 2 - Background
Chapter 3 - Definitions
Chapter 4 - Decision Framework
Chapter 5 - Enterprise Roles/Responsibilities
Chapter 6 - Methodology
Chapter 7 - Depiction
Chapter 8 - Best Practices
Chapter 9 - References

Pilot Program Breakout of Organic, A&AS, External Support (and others), and FTEs

How many FTEs does it take to perform CCA?

When conducted during an AoA:

Pilot Program	Organic	A&AS	External Support (FFRDC)	FTEs
F-15 EPAWSS	1.6			1.6

When conducted separate from the

Pilot Program	Organic	A&AS	External Support (FFRDC)	FTEs
3-DELRR	6.25	3	2	11.25
C-ASNT	Yes,	Yes	Yes	14
PAR	9.3	5.5	No	14.8

- **When CCA is incorporated into the AoA, it takes minimal additional effort**
- **Conducting CCA later requires re-establishing analysis teams, updating past work, and significant manpower**

Organizational Construct COAs Ad Hoc (Pick-up Team)

	Process Owner	Practitioner	Pros	Cons
COA 1 – "As-Is"	AFMC/A5C	Program Office (or AFLCMC/XZ)	• Low cost approach to CCA • Leverages existing experienced resources within A5C	• "Ad-hoc", pick-up team approach • Limited support of AoAs • No "hands-on" facilitator • No expertise • Increased start-up & rework • No learning curve benefits
COA 2	OAS	Program Office (or AFLCMC/XZ)	• Similar to OAS current mission	(same as COA 1 Cons) plus • More full time equivalents (FTEs) needed

Organizational Construct COAs Centralized

	Process Owner	Practitioner	Pros	Cons
COA 3	OAS	OAS	• Similar to OAS's current mission • CCA process owner portion natural addition to OAS function • OAS has Ops Research analysts • Home office approach to CCA leads to efficiencies and learning curve benefits	• Evaluating/assessing your own work presents bias • CCA not current mission • No "hands-on" facilitator • OAS current role is one of "Advisors" vs. "Practitioners" • Present physical location of OAS not conducive • Additional FTEs needed
COA 4	AFMC/A9A	AFMC/A9A Organizations considered: AFLCMC/FZC, AFLCMC/EZJ, and AFMC/FMC	• Aligns with current analysis mission, A9A has analysts in place • CCA natural fit to A9A especially if "Analysis Shop" is a reality • Home office approach to CCA leads to efficiencies and learning curve benefits	• "Full-bore" practitioner leading efforts not current practice of most HQ's offices • Stretches thin pool of Ops Research analysts • A9A current role of "Practitioners" expanded • Additional full time equivalents (FTEs) needed • No "hands-on" facilitator
COA 5	AFLCMC/XZ	AFLCMC/XZ	• New XP analysis shop already approved, CCA tasking a natural fit • Initial resources already approved, CCA FTE needs to "piggy back" • Aligns with analysis mission • Home office approach to CCA leads to efficiencies and	• Potential for other requirements to impede CCA efforts • Stretches thin pool of Ops Research analysts • No foundation in CCA work • Possible delays in implementing CCA with effort going to brand new organization just being established

Critical Steps in Defining Military Value

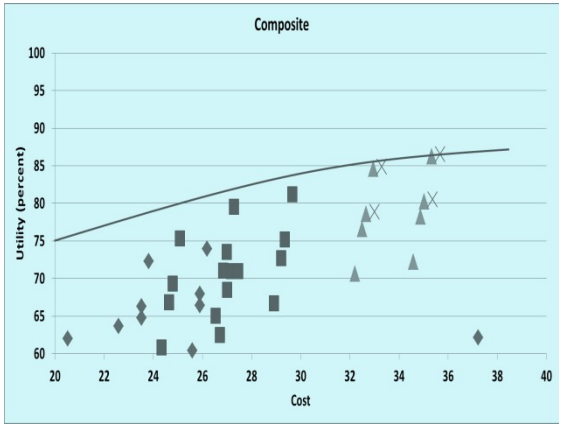
Inserting Military *Value* into the AoA upfront enables CCA

Using: sponsor/stakeholder input for value

Using: Elements of the AoA

- ***Effectiveness Analysis***
- ***Risk***
- ***Threats & Scenarios***
- ***Technology & Alternatives***
- ***Employment Concepts***
- ***Cost Analysis***

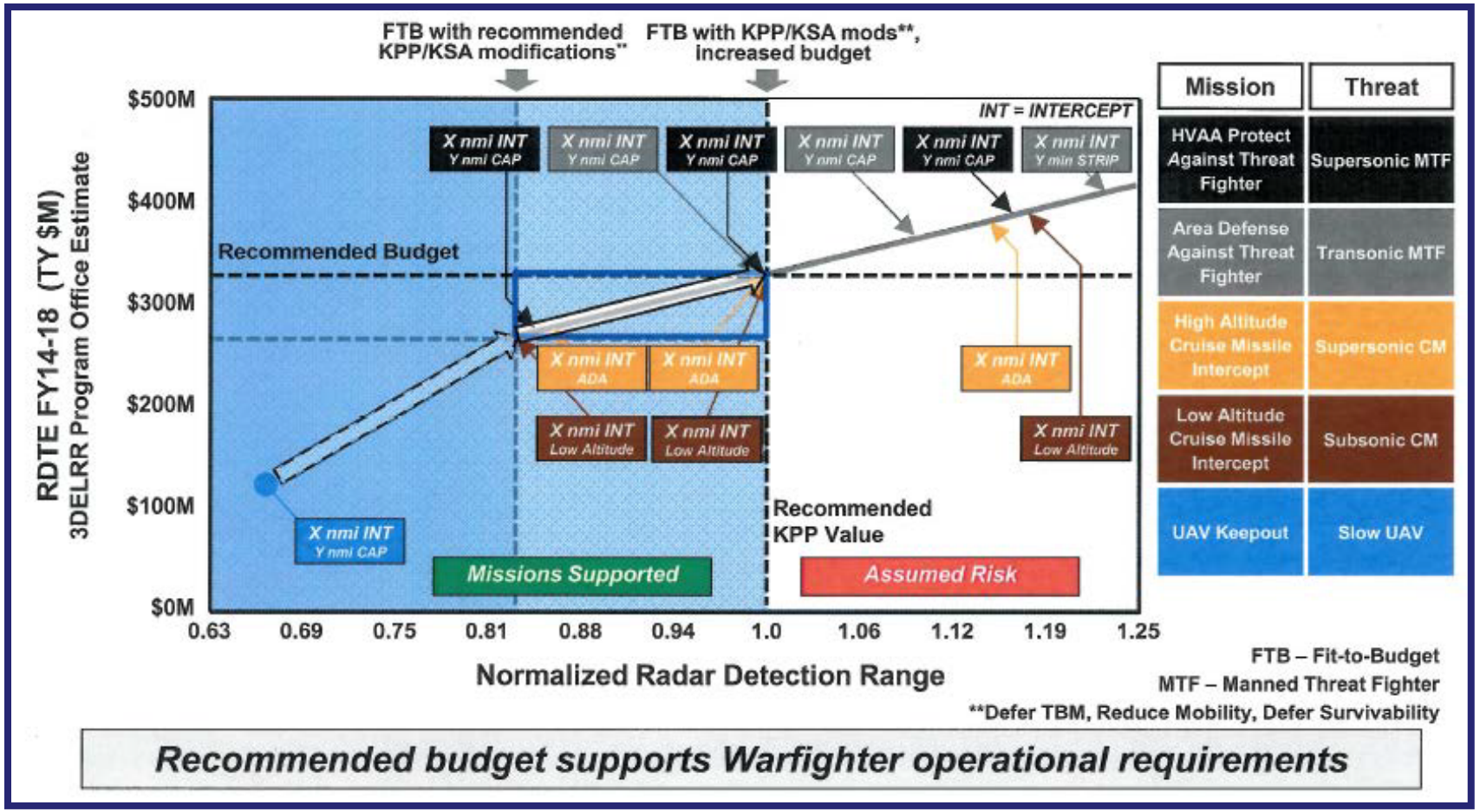
Integrating: effectiveness and cost



- **The CCA doesn't say what is the "best" alternative; in fact all alternatives on the efficient frontier are worthy**
- **Result of cost capability analysis is combined with other data (e.g., risk) to arrive at a recommendation**

Captured with detailed methodology in guidebook

3DELRR Depiction of Results



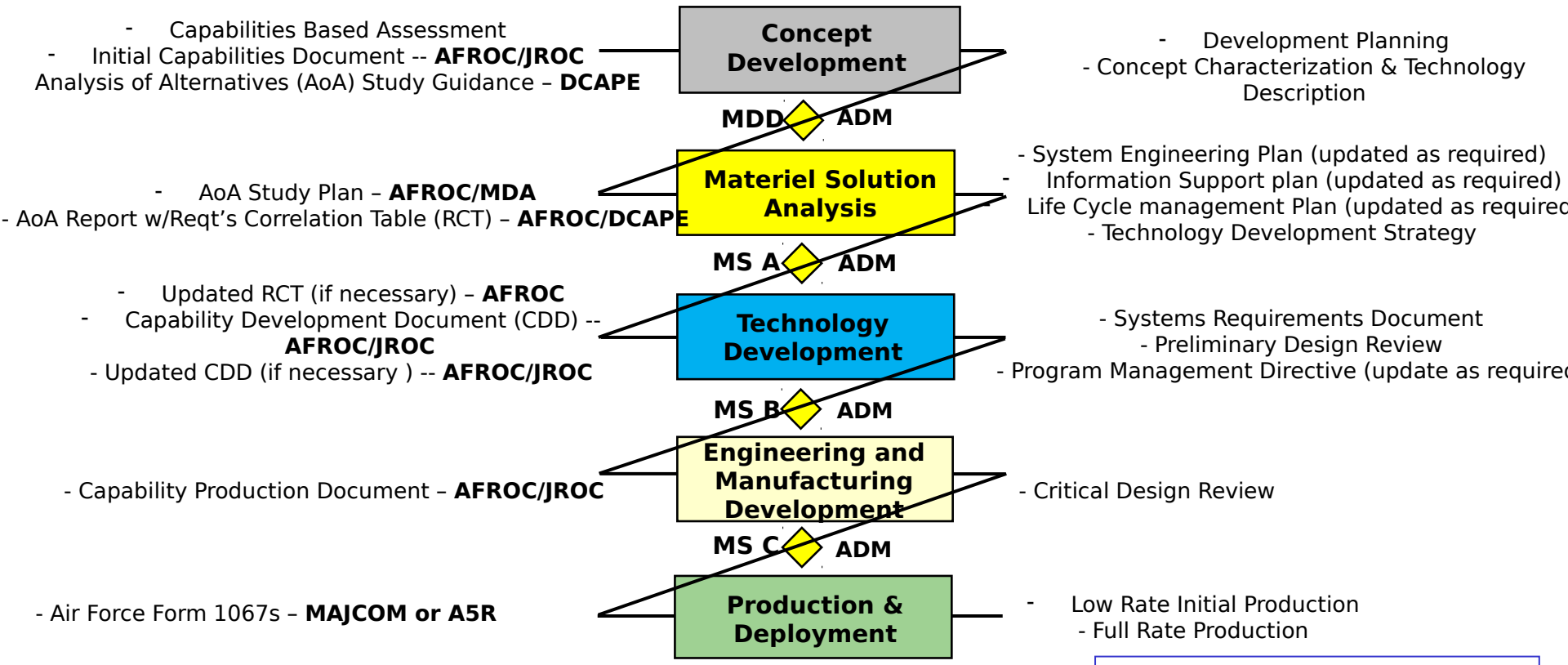
"Didn't truly understand what we could live with and without until cost is a variable in the trade space discussions"

FTP = Fit to Budget

Areas for Further Work

- **Cost Analysis**
  - **Development of standard methodology for early cost estimating and data collection**
  - **Enhance Pre-MS A cost estimating capabilities**
- **Systems Engineering**
  - **Consider standardized practice for identifying cost drivers in the CDD to facilitate trade discussions**

Requirements and Acquisition Synchronization


Requirements
Acquisition
- Capabilities Based Assessment
- Initial Capabilities Document -- AFROC/JROC
Analysis of Alternatives (AoA) Study Guidance – DCAPE
Concept Development
- Development Planning
- Concept Characterization & Technology Description
MDD
ADM
- AoA Study Plan – AFROC/MDA
- AoA Report w/Reqt's Correlation Table (RCT) – AFROC/DCAPE
Materiel Solution Analysis
- System Engineering Plan (updated as required)
- Information Support plan (updated as required)
Life Cycle management Plan (updated as required
- Technology Development Strategy
MS A
ADM
- Updated RCT (if necessary) – AFROC
- Capability Development Document (CDD) -- AFROC/JROC
- Updated CDD (if necessary) -- AFROC/JROC
Technology Development
- Systems Requirements Document
- Preliminary Design Review
- Program Management Directive (update as required
MS B
ADM
- Capability Production Document – AFROC/JROC
Engineering and Manufacturing Development
- Critical Design Review
MS C
ADM
- Air Force Form 1067s – MAJCOM or A5R
Production & Deployment
- Low Rate Initial Production
- Full Rate Production

MDD = Materiel Development Decision
ADM = Acquisition Decision Memorandum

Requirements & Acquisition Processes Must Be Synchronized